RoboCup and AAAI

Rescue Robot Competition Rules

- 2004 (Version 1)-

PRESENTATION OUTLINE

LEAGUE BACKGROUND

- League Vision
- Search and Rescue Scenario
- Need for Rule Changes

RULES for 2004:

- General Rules
- Negotiating Arenas
- Finding Victims
- Scoring Points
- Performance Metric

LEAGUE BACKGROUND

RESCUE ROBOT LEAGUE VISION

When disaster happens, minimize risk to search and rescue personnel, while increasing victim survival rates, by fielding teams of collaborative robots which can:

- Autonomously negotiate compromised and collapsed structures
- Find victims and ascertain their conditions
- Produce practical maps of their locations
- Deliver sustenance and communications
- Identify hazards
- Emplace sensors (acoustic, thermal, hazmat, seismic,…)
- Provide structural shoring

…allowing human rescuers to quickly locate and extract victims.

SEARCH AND RESCUE SCENARIO

A building has partially collapsed due to earthquake.

The Incident Commander in charge of rescue operations at the disaster scene, fearing secondary collapses from aftershocks, has asked for teams of robots to immediately search the interior of the building for victims.

The mission for the robots and their operators is to find victims, determine their situation, state, and location, and then report back their findings in a map of the building and a victim data sheet. These will immediately be given to human rescue teams preparing to extract all victims that are found.

The section near the building entrance appears relatively intact while the interior of the structure exhibits increasing degrees of collapse. Initially, robots must negotiate the lightly damaged areas prior to encountering the more challenging obstacles and rubble in their search for survivors. But other, more difficult, entrances may be available.

The robots are considered expendable in case of difficulty.

NEED FOR RULE CHANGES

Deter parallel teleoperation in separate arenas

- Solution: Force robots to traverse arenas sequentially

Deter sequential teleoperation in separate arenas

- Solution: Remove "Number of Robots" in scoring formula

Deter false victim identifications

- Solution: Add penalties for errors in scoring formula

Promote use of multiple sensors

- Solution: Add incentives for multiple sensor identifications
- Solution: Add incentives for correctly identifying victim

"Situation"	(surface/trapped/void/entombed)
"State"	(unconscious/semi-conscious/aware)

NEED FOR RULE CHANGES

STILL UNDER DISCUSSION

GOAL:

Promote limited use of radio communications for eventual field use AND encourage bounded autonomy

SOLUTION:

Simulate radio communication blackout during mission by imposing a HANDS OFF/EYES OFF period within the mission

- 2 minute blackout in later half of mission (30 second advanced warning)

  (next year: blackout time increases, warning goes away)

We could also…

- Add bonus time at end of mission for HANDS OFF/EYES OFF operation only

and/or

- Amplify scoring during HANDS/EYES OFF period

GENERAL NOTES

TEAM POSTERS

To foster collaboration among teams from this league and others, we encourage advertising your particular approach to search and rescue in posters displayed in your set-up area.

- Promote your technical ideas and approach toward search and rescue
  - mechanisms
  - mobility
  - sensors
  - control
  - operator interfaces
- Advertise your organization
- Identify contact information for casual viewers

*** ALL TEAMS MUST CLEARLY DISPLAY THEIR WIRELESS COMMUNICATION FREQUENCIES, CHANNELS, POWER LEVELS, NETWORK NAME, and TEAM NAME ON A LETTER SIZE PAGE.

PRACTICE IN THE ARENAS

To promote technology development, collaboration among teams, and general research goals, we encourage practicing within the arenas:

- All teams may practice within the arenas during team set-up days.
- Some teams may be asked to demonstrate their robots to the public at certain times (for example opening/closing ceremonies). We'll try not to burden any team nearing a competitive mission.
- Once the competition starts, no teams are allowed to practice in the arenas during competition hours. Practice may begin again after hours each day.
- Once a team has been disqualified, they are encouraged to practice in the arenas any time accept during competition hours.

VIDEO TAPING

To support team development while limiting specific knowledge of arena setup, we must restrict certain video taping of robots and arenas:

- No video taping of robots (or otherwise) is allowed in or around arenas before each day's missions
- Team members not involved in operation of the robot may watch (and video tape) their robots during each mission. But they may not be called to help the operator in any way.
- The chair will capture up-close video of each robot during each mission and distribute to the team after the competition is over. This video will used to:
  - Document what happens for each robot
  - Help learn from success and failures
  - Help promote search and rescue applications and the league in general

GENERAL RULES

TEAM SETUP FOR MISSIONS

To maintain an ambitious schedule of missions, and ensure that team setup for each mission is timely and efficient, the following rules apply:

- Teams may trade time slots with other teams if mutually beneficial – but both team leaders must notify the chair at least one mission prior to the negotiated mission start time
- Failure to be ready for any scheduled mission scores (0) for that mission
- Teams should have their robots and operator equipment on a rolling cart at least 15 minutes prior to their mission.
- Teams should wait in the team preparation area until a league official asks you to approach the operator station.
- Teams will have 10 minutes to move into position and set up at the operator station (while the previous team exits from an adjacent area)
- Teams must demonstrate all functional robot sensing, localization, and mapping capabilities to the Judge prior to the start each mission

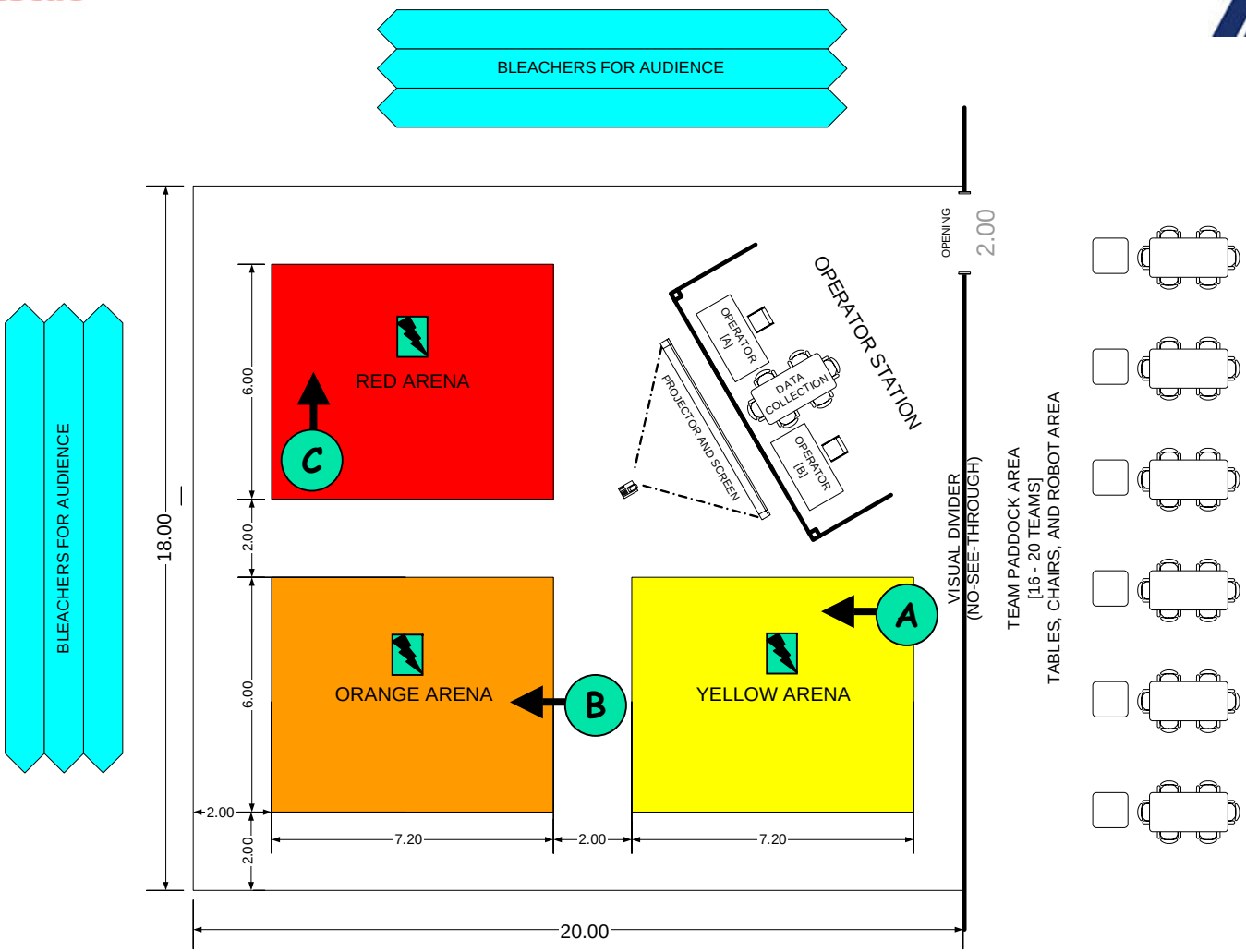
COMPETITION ROUNDS and MISSIONS

To provide multiple search missions for each team, require modest robot stamina, encourage easy set-up/break-down, and allow some chance of failure without consequence, the competition has the following format:

- Each mission lasts 20 minutes (plus 10 minutes for set-up)
- Each competitive round consists of 2 or 3 missions
- In preliminary rounds, you will likely be able to drop one mission score
- A pre-determined number of teams with the highest scores advance to the next round of competition (or the chair may apply a minimum threshold score for advancement based on overall scoring results)
- The number of competitive rounds and missions per round may change depending upon days available and number of teams

NOTE: The team that wins should demonstrate effective and reliable implementations over several 20 minute missions (more than 1 hour of operation over a couple of days)

SQUARE LAYOUT AND START POINTS

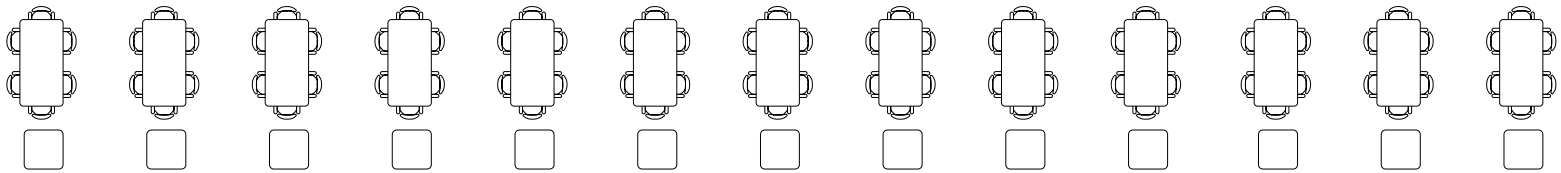


LAYOUT WILL BE DETERMINED PRIOR TO COMPETITION

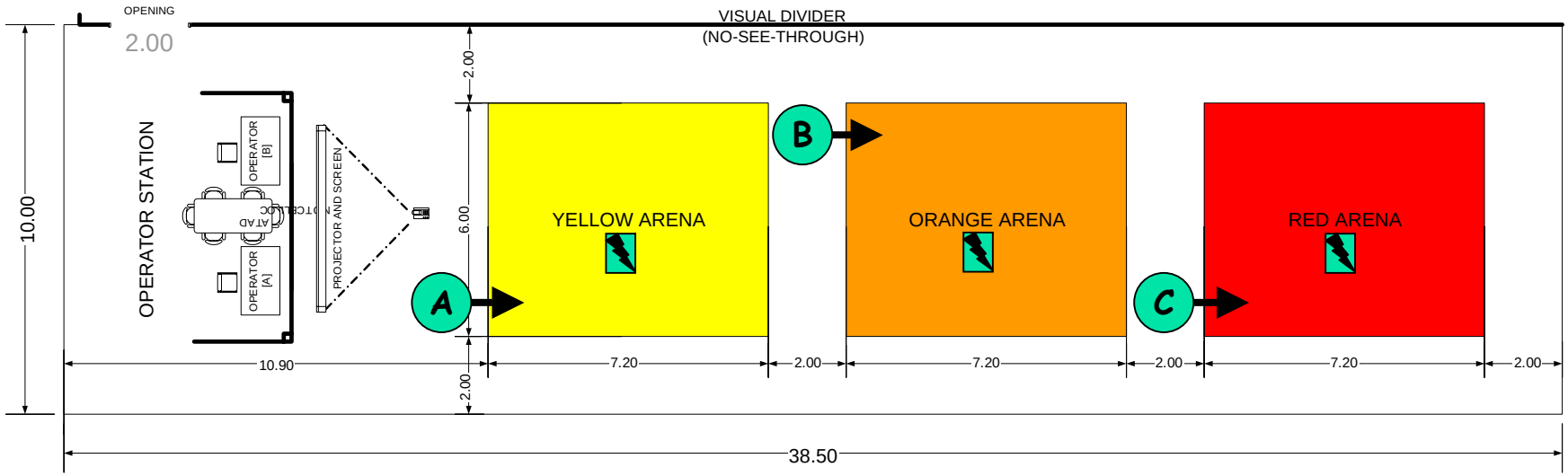
A/C POWER 20A @ 110V

DIMENSIONS IN METERS

COLUMN LAYOUT AND START POINTS



TEAM PADDOCK AREA
[16 - 20 TEAMS]
TABLES, CHAIRS, AND ROBOT AREA



BLEACHERS FOR AUDIENCE

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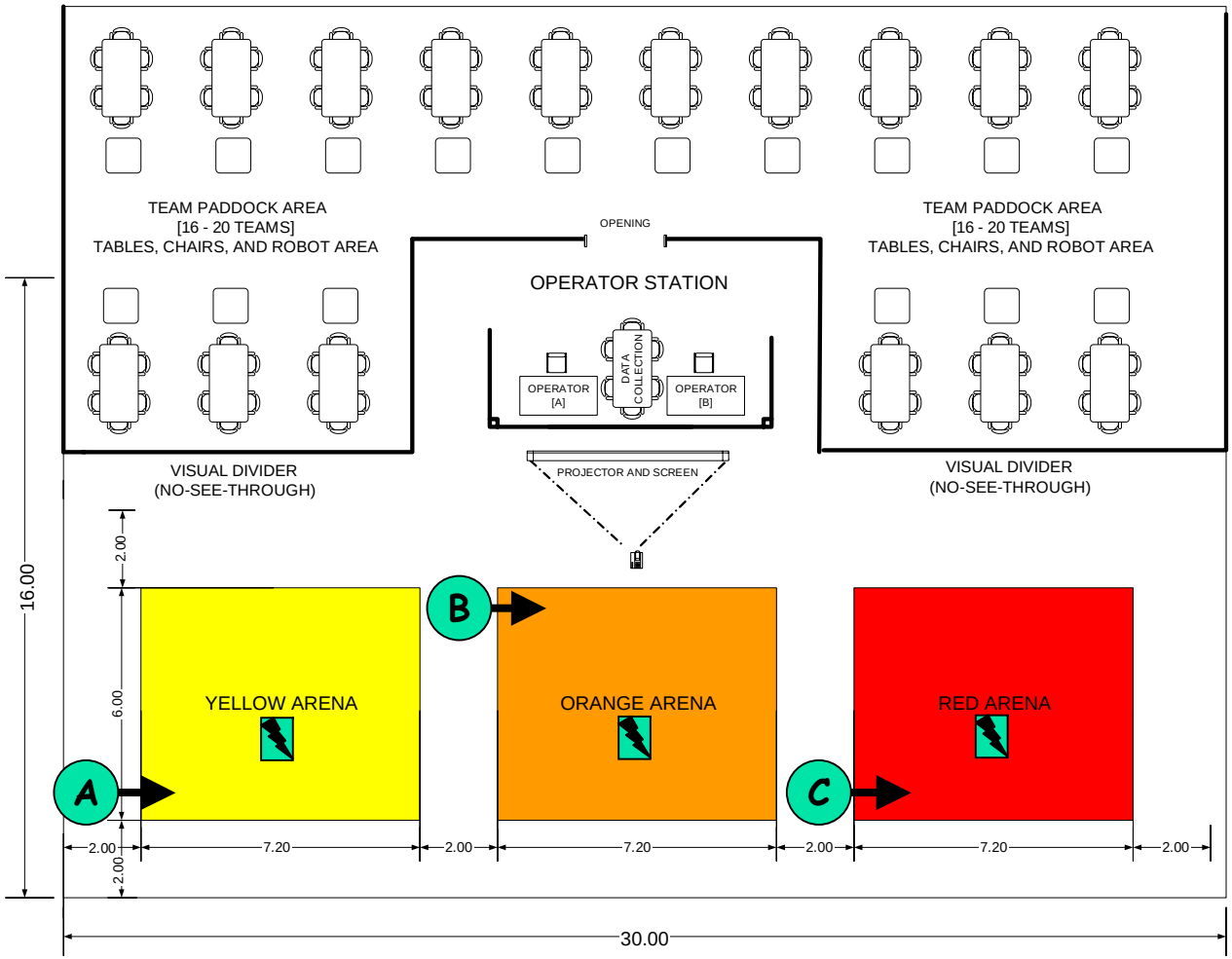
LAYOUT WILL BE DETERMINED PRIOR TO COMPETITION

A/C POWER
20A @ 110V

DIMENSIONS IN METERS

TEE LAYOUT AND START POINTS



LAYOUT WILL BE DETERMINED PRIOR TO COMPETITION

BLEACHERS FOR AUDIENCE

BLEACHERS FOR AUDIENCE

A/C POWER
20A @ 110V

DIMENSIONS IN METERS

MISSION START POINTS

To similarly test mapping and planning capabilities, while allowing robots better access to their intended arenas, each round of competition will proceed as follows:

- **First mission of every round:** Teams must begin at START POINT [A] and must negotiate the Yellow arena.

- **Middle mission of every round (if any):** Teams must begin at START POINT [B], between the Yellow and Orange arenas. Teams may enter either arena.

- **Last mission of every round:** Teams may choose their start point, START POINT [A], [B], or [C], but may not repeat their previous start point.

  NOTE: After starting, all teams must follow the rule of Advancing & Retreating (next page).

ADVANCING & RETREATING

To promote collaboration between robots, and deter parallel teleoperation in separate arenas, the following rules apply:

Advancing to more difficult arenas:

- Robots are always free to advance to the next most difficult arena, but they must earn it by leaving the simpler arena through the door on the far side of the arena from their start point.
- Robots may always advance without the entire team of robots

Retreating to simpler arenas:

- Robots are always free to retreat to a simpler arena already negotiated during the current mission
- Retreating to a simpler arena not successfully negotiated during the current mission must be done as a team (all robots gather at the mission start point before entering the simpler arena). Teams may need to use "RESETs" if necessary to retrieve robots stuck in the more difficult arena. Once retreating, robots may retreat as far as they can without the entire team of robots.

RESETS

Operator can call 'RESET'

- Judge returns robot to starting point
- Time continues to run
- Penalty: add one operator in score

Self-Reset

- Robot can return to starting zone by itself for operator repair
- Operator can continue setup during mission time
- Penalty: none

'Out of Bounds RESET'

- Occurs when a robot leaves both the 'HOT' and 'WARM' zones
- Imposed at the discretion of the judge
- Penalty: add one operator in score

NEGOTIATING ARENAS TO FIND VICTIMS

Since the arenas are small compared to a building, and there are several ways to thwart the intention of the arena design, the following rules apply:

- Robots must pass under crossbars or through other obvious portals when traveling through arenas
- Robots must enter the same area as the victim for identification. No victim identifications allowed:
  - Over maze walls
  - Through glass walls
  - Through mesh walls or netting
  - Looking over obstacles (not walls) or through access holes is encouraged
- Robots must surmount an elevated level to identify victims on that level, unless the robot is looking up/down through access holes such as:
  - Elevated floor holes
  - Into box obstacles
- Knowing (seeing) a victim is there does not mean you have identified that victim or any particular signs of life. Keep searching for a way to get into the same room, or onto the same level, as the victim.

SIMULATED VICTIMS

HUMAN FORM

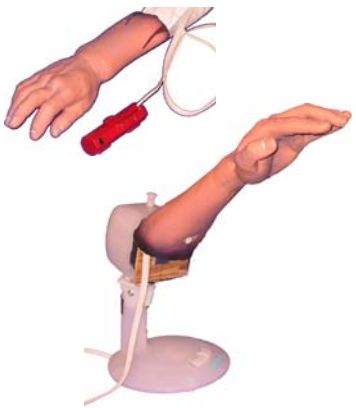
CLOTHING: DUST COVERED OR COLORFUL

REFLECTIVE TAPE

LOCATOR STROBE

VICTIM TAG

WAVING ARMS MOVING FINGERS



TAPPING

LOCATOR ALARM

VOICE

BODY HEAT

CO2 EMISSIONS

SIMULATED VICTIMS

Operator must SHOW all perceived signs of life to the Judge

- Judges (with the operator) note the validity of the call based on the information shown in the operator interface
- Referees (with the robot) note the order that the victims are found and what signs of life are available on any given victim

Victims are not counted twice, even if found by a different robot

SIGNS OF LIFE:

- Form: Shape, color, …
- Motion: Moving appendages,…
- Heat: Body heat (heating blankets)
- Sound: Voice, beacons, tapping
- Chemical: CO2 emissions

SITUATIONS:

- Surface
- Trapped
- Void
- Entombed

STATES:

- Aware
- Semi-conscious
- Unconscious

PERFORMANCE METRIC

PERFORMANCE METRIC (2004)

The intent of the performance metric for this competition is to encourage certain desirable robot capabilities while discouraging certain unhelpful team strategies.

There are (50) points available for each victim found:

- **(20) points for Mapping** reward map QUALITY and accurate LOCATION of victims and features
- **(15) points for Mobility** reward capabilities required to identify the victim SITUATION and for advanced mobility required to read the VICTIM TAG.
- **(15) points for Sensing** reward individual sensor capabilities and for correctly identifying the victim STATE

NOTE: Points may be deducted for errant identifications, so be sure of what you are reporting. Would you send in a human rescuer based on the information you're reporting?... that's the question.

PERFORMANCE METRIC (2004)

50 POINTS POSSIBLE PER VICTIM FOUND

PENALTIES PER EVENT

$$\text{ARENA WEIGHTING} \left(\frac{\text{MAP QUALITY} + \text{VICTIM LOCATION} + \text{VICTIM TAG} + \text{VICTIM SITUATION} + \text{VICTIM STATE} - \text{ARENA BUMPING} - \text{VICTIM BUMPING}}{\left[1 + \text{NUMBER OF OPERATORS} \right]^2} \right)$$

PERFORMANCE METRIC (2004)

$$\text{ARENA WEIGHTING} = \left(\frac{\text{MAP QUALITY} + \text{VICTIM LOCATION} + \text{VICTIM TAG} + \text{VICTIM SITUATION} + \text{VICTIM STATE} - \text{ARENA BUMPING} - \text{VICTIM BUMPING}}{\left[1 + \text{NUMBER OF OPERATORS} \right]^2} \right)$$

ENCOURAGES VALIDATION OF LOCALIZATION
(EFFECTIVE ARENA MAPPING)

1.00/0.75/0.50

10 PTS 5 PTS 1 PTS

10 PTS 5 PTS 1 PTS

+ 10 PTS - 10 PTS

+ 5 PTS

+ 15 PTS - 10 PTS

-20 PTS -5 PTS

-20 PTS -5 PTS

FORM +/- 1 PTS
MOTION +/- 1 PTS
HEAT +/- 3 PTS
SOUND +/- 2 PTS
CO2 +/- 3 PTS

STATE + 5 PTS
(need 3 correctly interpreted)

ENCOURAGES ADVANCED MOBILITY

ENCOURAGES SENSOR FUSION

MAP QUALITY

MAP QUALITY (10 of 50 pts per victim)

Refers to the paper-based map of the arenas submitted to the Incident Commander (Judge) within two minutes after the end of your mission time expires. All maps should indicate the following:

- Victim LOCATION clearly marked with reference to VICTIM DATA SHEET
- Pertinent features (doors, windows, stairs, collapses, etc.)
- DO NOT start with a line denoting the perimeter of the arena
- *Hint: Could an audience member use your map?... does it have all the necessary information on it?*

SCORING

(**10 Points**) Fully automatic, robot sensor generated, accurate map of arena interiors automatically showing victim locations and reference to VICTIM DATA SHEET. Human labeling of obstacles and features only. No corrections of map

(**5 Points**) Robot sensor generated, human interpreted map of the arena interiors. Victim locations, obstacles and features may be hand written. Hand corrections may be discounted by the Judge if considered influenced by operator knowledge of the arena

(**1 Point**) Human generated map (hand or computer drawn) of the arenas or topological directional information to the the victim.

VICTIM LOCATION

VICTIM LOCATION (10 of 50 pts per victim)

Refers to the Mapped location of a found victim, which should indicate any part of a found victim to within 1 cubic meter. Note that the Incident Commander (Judge) will USE your map to find these victims. If your map is not clear enough to follow, you will not score ANY points for that victim.

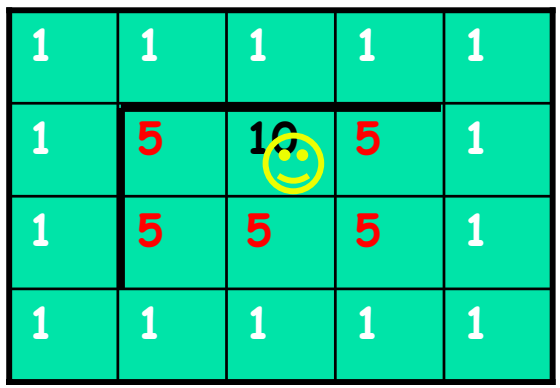
Hint: For accuracy, reference locations from easily identifiable arena features rather than from the start point.

SCORING

(**10 points**) Locating a victim to within 1 cubic meter

(**5 points**) Adjacent cube is called (not through walls)

(**1 point**) Any other cube is called



VICTIM SITUATION

VICTIM SITUATION (5 of 50 pts per victim)

Requires understanding the victim's rescue needs by discerning what type of rescue SITUATION a victim is in:

- SURFACE: Entirely visible *(head/torso and legs or baby)*
- TRAPPED: Partially visible under light rubble *(head/torso)*
- *VOID:* *Minimally visible in void under collapse `(legs or baby)*
- *ENTOMBED:* *Not visible without probing (arm, sound, heat, CO_2)*
- UNKNOWN

VICTIM STATE

VICTIM STATE (15 of 50 pts per victim)

- Requires identifying a victim's sensor signatures and increasing confidence through multiple sensor signatures
- If you correctly identify at least (3) sensor signatures you may attempt to determine the victim's STATE for bonus points.

- ❑ FORM (+/- 1 POINT)
- ❑ MOTION (+/- 1 POINT)
- ❑ HEAT (+/- 3 POINTS)
- ❑ SOUND (+/- 2 POINTS)
- ❑ CO_2 (+/- 3 POINTS)

- ❑ VICTIM STATE (5 POINTS)
  - ❑ **AWARE**: Fully conscious and moving (arm waving and/or yelling)
  - ❑ **SEMI-CONSCIOUS**: Not aware but may be moving (finger moving or moaning)
  - ❑ **UNCONCIOUS**: No motion, no sound (has heat and may have alarm and CO_2)
  - ❑ **UNKNOWN**

VICTIM TAG

VICTIM TAG (+/- 10 of 50 pts per victim)

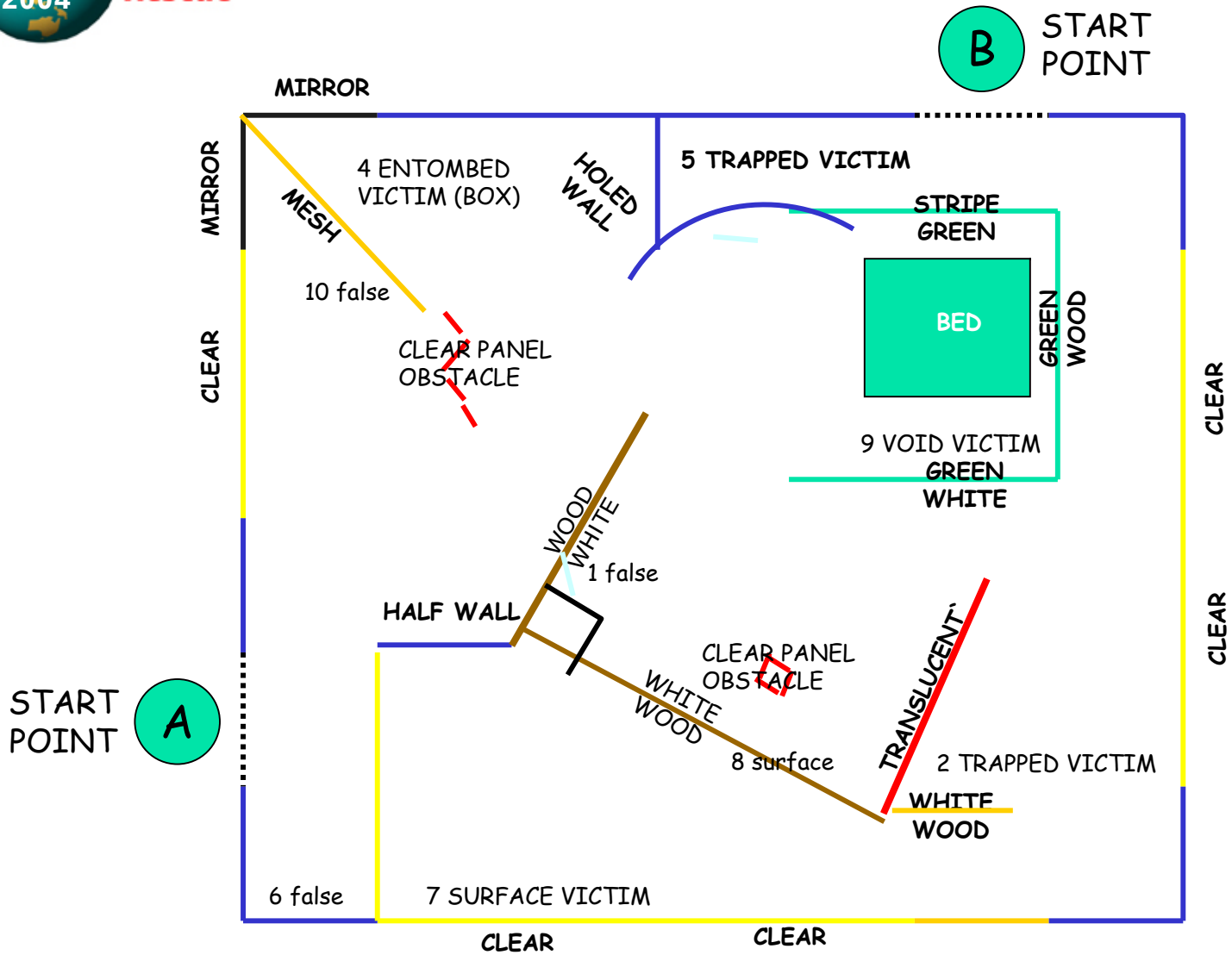
All victims have VICTIM TAGS prominently displayed, but may not be easily visible. Achieving the proper viewing position may be an extreme test in mobility. If you can read the tag along with all your other signs of life, score (+10) points.

Note, however, that identification tags are also placed throughout the arenas as likely locations to search for victims (analogous to a rescue dog handler's pointing motion).

Hint: Be careful not to be too quick to identify VICTIM TAGS from a distance, because reporting a VICTIM TAG that is not associated with a victim will cost you (-10) points. So be sure you identify other signs of life in addition to the VICTIM TAG.

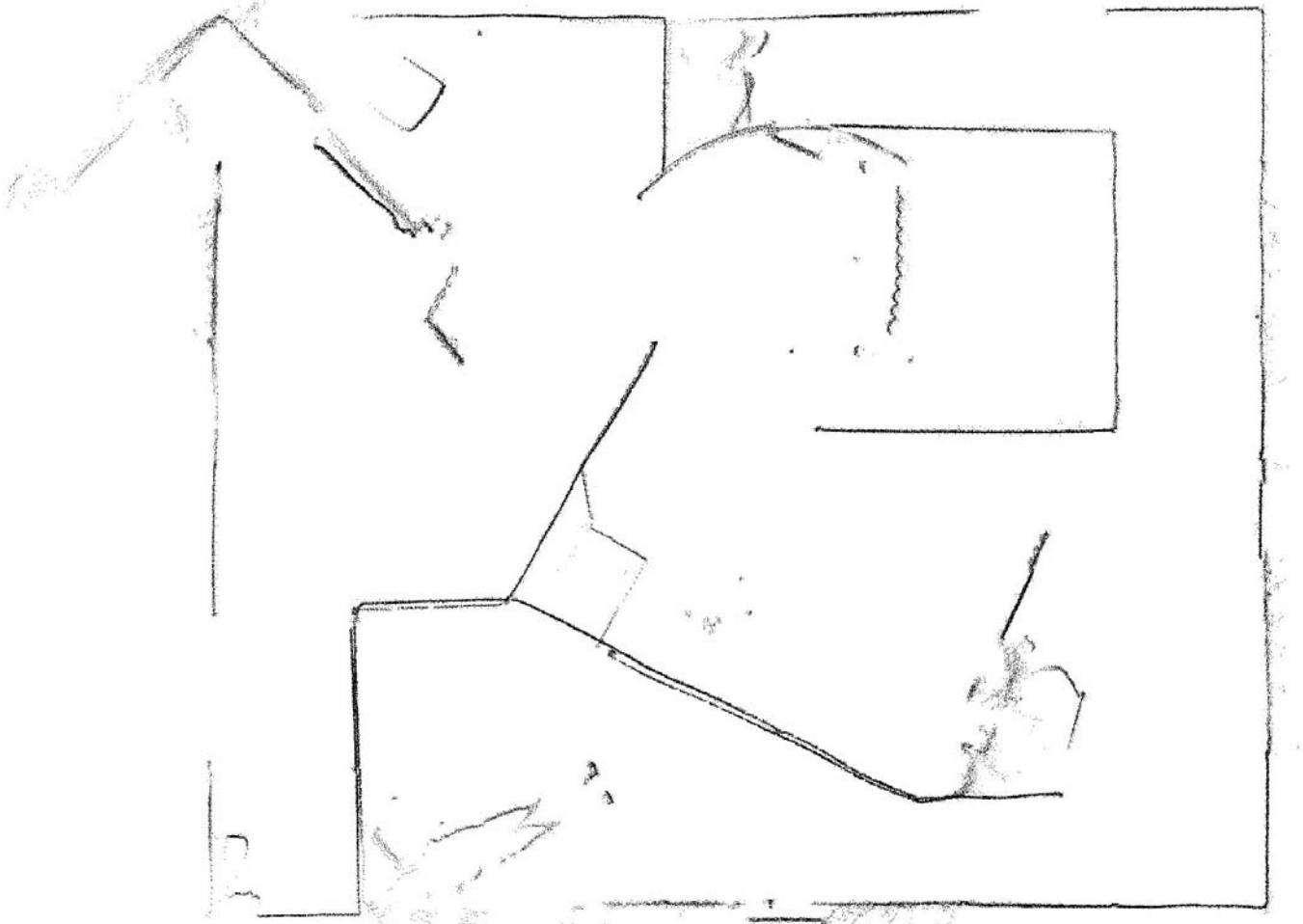
For this competition, VICTIM TAGS will display numbers.

EFFECTIVE ARENA MAPPING (Set-up Plan)



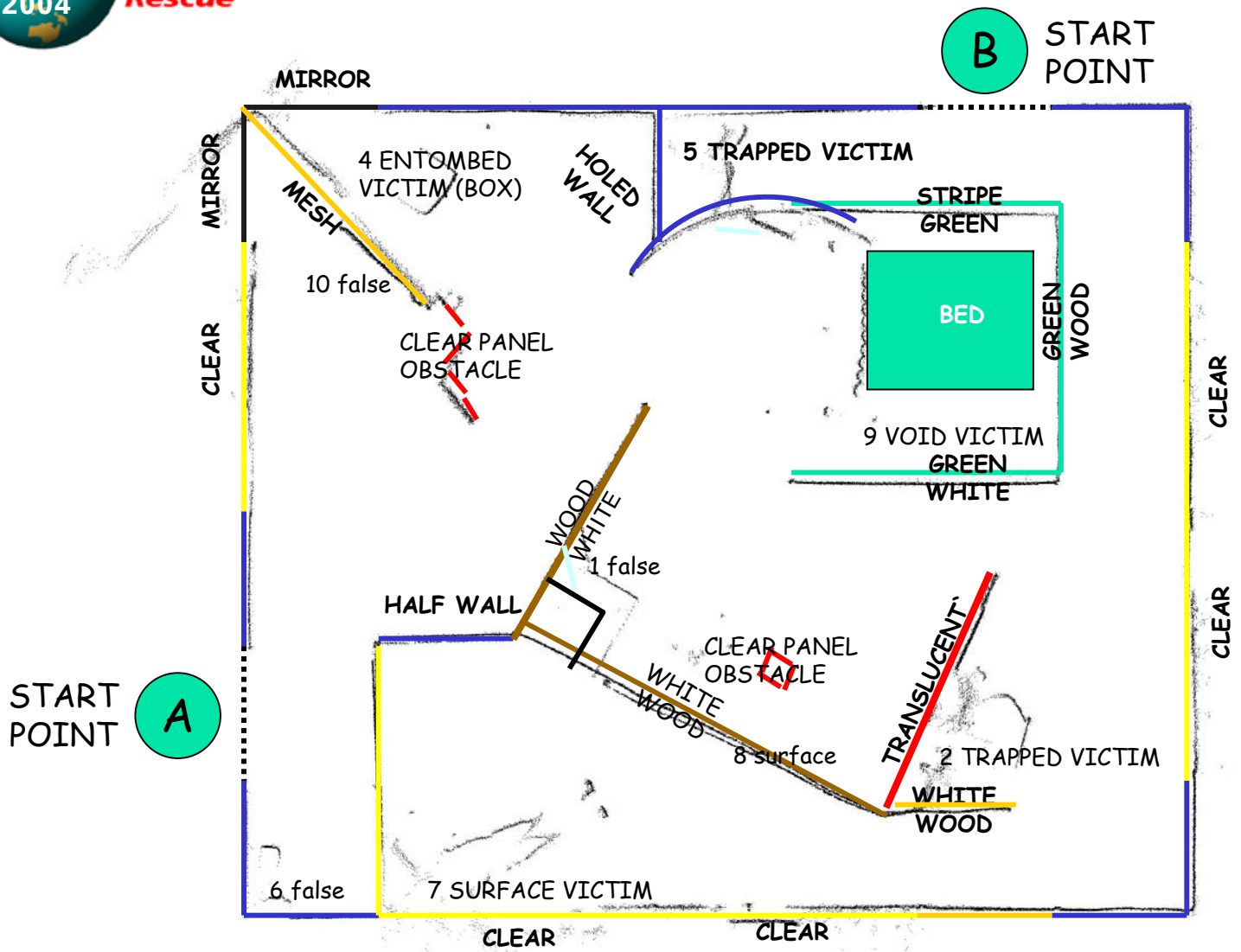
EFFECTIVE ARENA MAPPING (LADAR Map)

EXTREMELY GOOD AUTOMATIC MAPPING OF WALLS AND FEATURES,
ADD VICTIM POSITIONS FOR MAXIMUM POSSIBLE SCORE



LADAR map generated by ActivMedia, Inc.
www.activmedia.com

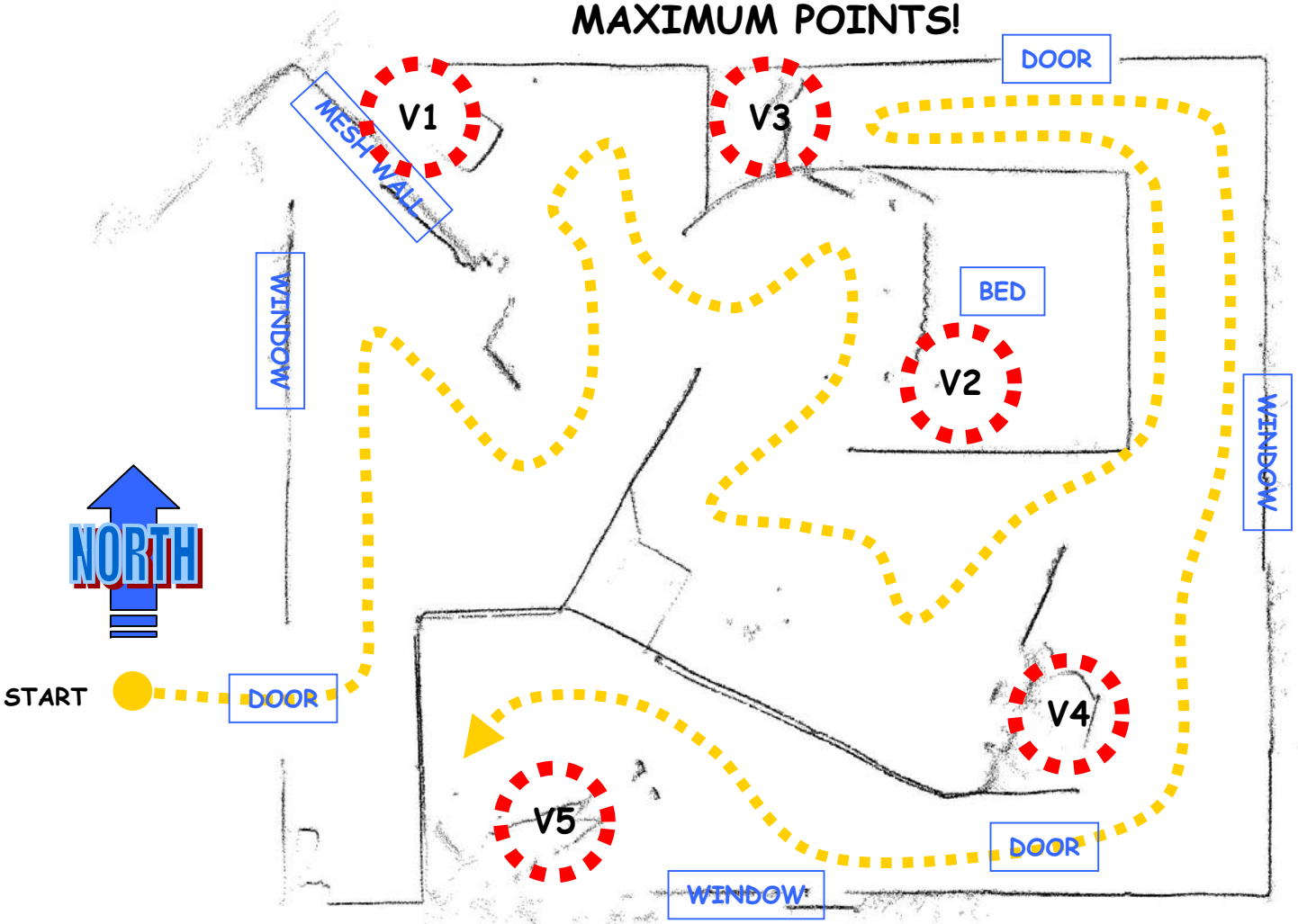
EFFECTIVE ARENA MAPPING (Plan and Map)



LADAR map generated by ActivMedia, Inc.
www.activmedia.com

EFFECTIVE ARENA MAPPING (EXAMPLE)

THIS MAP, AUTOMATICALLY GENERATED, WOULD SCORE MAXIMUM POINTS!



V1:
SITUATION: ENTOMBED
STATE: CONSCIOUS
TAG#: 4

V2:
SITUATION: VOID
STATE: SEMI-CONSCIOUS
TAG#: 9

V3:
SITUATION: TRAPPED
STATE: CONSCIOUS
TAG#: 5

V4:
SITUATION: TRAPPED
STATE: UNCONSCIOUS
TAG#: 2

V5:
SITUATION: SURFACE
STATE: UNCONSCIOUS
TAG#: 7

LADAR map generated by ActivMedia, Inc.
www.activmedia.com

PENALTIES

ARENA BUMPING

- Uncontrolled Bumping (-5 points per incident)
  Example: Undesirable contact with environment that does not result in damage
- Heavy Damage (-20 points per incident)
  Example: Undesirable shifting or damage to environment

VICTIM BUMPING

- Bumping Victim (-5 points per incident)
  Example: Contact with a victim's torso, legs, or head (not hands or feet)
- Harming Victim (-20 points per incident)
  Example: Contact that clearly repositions or "harms" a victim

Penalties May Compound

- *Example: Causing 'Heavy Damage' (-20 points) to arena which results in 'Harming' a victim (-20 points) = 40 point deduction*

PROCEDURES, DEFINITIONS AND OTHER STUFF

SUGGESTED TEAM PROCEDURE

Victims are found by following all the steps below (in suggested order):

Determine:

1) VICTIM SITUATION (*sensors*: surface, trapped, void, entombed
2) VICTIM STATE (*sensors*: aware, semi-conscious, unconscious)
3) VICTIM TAG (*operator*)
4) VICTIM LOCATION (*sensors and/or operator*)

Then:

5) Map the VICTIM LOCATION
6) Complete the VICTIM data sheet
7) Notify the Incident Commander you have found a victim (identify the victim using the VICTIM TAG)
8) Show the Incident Commander a view of the TAG, SITUATION, all sensor readings leading to a STATE, and how you determined your LOCATION

ADMINISTRATIVE PROCEDURE

1) Teams submit all VICTIM data sheets

2) Teams submit MAP for each arena

3) Referees submit sheets detailing victims found and penalties assessed

4) Incident Commander (Judge) follows map to find victims and scores accordingly

DEFINITIONS: HOT ZONE

Yellow Arena

- 2-D maze with no flooring issues
- Arena weighting = 0.50

Orange Arena

- 3-D maze with variable household/office flooring
- Arena weighting = 0.75

Red Arena

- Totally unstructured and unstable
- Arena weighting = 1.00

NOTE: No team members allowed in the field of play once competition starts!

DEFINITIONS: WARM ZONE

Operator station

- Faces away from "Hot Zone"
- Only essential team operators should be present during a mission
- Everybody who enters the warm zone during a mission will count as an operator during that mission

Starting Point

- All team members may place and initialize the robot prior to the mission

NOTE: Any member of a team found in the "Warm Zone" during another team's mission will be penalized at the discretion of the Chairs.

DEFINITIONS: COLD ZONE

- Contains TEAM PREPARATION ROOMS and STAGING AREA.
- All team members, that are not acting as operators, have the option to observe their mission and any subsequent team missions of a round.
- All observing team members must stay in the spectator areas and may not interact with their operator.
- Any team members that may wish to be additional operators during the course of their mission, must remain in the "Cold Zone" until requested.

DEFINITIONS: OPERATORS

The intent of this rule is to encourage an increase in the ratio of robots to operators by demonstrating bounded autonomy and high level management of multiple robots.

- Any person present in the "Warm Zone" during a mission
- Any person who touches, interacts with, or controls the robot during a mission
- Any person who helps prepare the map or fill in the VICTIM sheet (see next page)

VICTIM

TEAM	RD/MSN	TOTAL

TAG (+/- 10 of 50 pts per victim)

❑ YELLOW ❑ ORANGE ❑ RED

V - TAG# [+10] [-10]

SCORE

MAPPING (+20 of 50 pts per victim)

❑	LADAR	MAP QUALITY
❑	SONAR	[+1][+5][+10]
❑	DRECKON	LOCATION
❑	TELEOP	[+1][+5][+10]
❑	OTHER	

SCORE

STATE (+15/-5 of 50 pts per victim)

	SENSOR	INDICATOR		
❑	FORM	_____	[+1]	[-1]
❑	MOTION	_____	[+1]	[-1]
❑	HEAT	_____	[+3]	[-3]
❑	SOUND	_____	[+2]	[-2]
❑	CO_2	_____	[+3]	[-3]

IF YOU HAVE (3) OF THE ABOVE INDIACTORS CHOOSE:

VICTIM STATE:

❑	AWARE:	*WAVING, YELLING*	[+5]
❑	SEMI:	*TWITCHING, MOANING*	[+5]
❑	UNCONCIOUS:	*NO MOTION, BEACON*	[+5]
❑	UNKNOWN		[0]

SCORE

SITUATION (+/-5 of 50 pts per victim)

	SIUATION	INDICATOR	(CIRCLE ONE)
❑	SURFACE (*Entirely visible*)		[+5]
	FULL BODY UPPERBODY LEGS ARM BABY		
❑	TRAPPED (*Partially visible under rubble*)		[+5]
	FULL BODY UPPERBODY LEGS ARM BABY		
❑	VOID (*Minimally visible in void*)		[+5]
	FULL BODY UPPERBODY LEGS ARM BABY		
❑	ENTOMBED (*Visible only with probing*)		[+5]
	FULL BODY UPPERBODY LEGS ARM BABY		
❑	UNKNOWN		[0]

SCORE

DEFINITIONS: REFEREES

- Either organizing officials or non-competing team members
- Responsibilities
  - tracks the robot through the mission
  - notes victim identifications
  - assigns penalties (arena damage and victim harm)
- One referee per robot
- Must observe in an non-interference manner
- Fills in the REFEREE sheet

REFEREE

RoboCup 2004 Rescue

TEAM | RD/MSN | START/END

ROBOT NAME | VIDEOGRAPHER

VICTIMS FOUND

V	ARENA	TAG#	SENSOR IDS	NOTES
V-1	Y - O - R	___	F - M - H - S - C	_____
V-2	Y - O - R	___	F - M - H - S - C	_____
V-3	Y - O - R	___	F - M - H - S - C	_____
V-4	Y - O - R	___	F - M - H - S - C	_____
V-5	Y - O - R	___	F - M - H - S - C	_____
V-6	Y - O - R	___	F - M - H - S - C	_____
V-7	Y - O - R	___	F - M - H - S - C	_____
V-8	Y - O - R	___	F - M - H - S - C	_____
V-9	Y - O - R	___	F - M - H - S - C	_____
V-10	Y - O - R	___	F - M - H - S - C	_____

RESETS ○ ○ ○ ○ ○ ○

YELLOW ARENA PENALTIES

BUMPING (-5 PTS) ○ ○ ○ ○ ○
DAMAGE (-20 PTS) ○ ○ ○ ○ ○

HURTING (-5 PTS) ○ ○ ○ ○ ○
HARMING (-20 PTS) ○ ○ ○ ○ ○

YELLOW PENATIES

ORANGE ARENA PENALTIES

BUMPING (-5 PTS) ○ ○ ○ ○ ○
DAMAGE (-20 PTS) ○ ○ ○ ○ ○

HURTING (-5 PTS) ○ ○ ○ ○ ○
HARMING (-20 PTS) ○ ○ ○ ○ ○

ORANGE PENALTIES

RED ARENA PENALTIES

BUMPING (-5 PTS) ○ ○ ○ ○ ○
DAMAGE (-20 PTS) ○ ○ ○ ○ ○

HURTING (-5 PTS) ○ ○ ○ ○ ○
HARMING (-20 PTS) ○ ○ ○ ○ ○

RED PENALTIES

REFERREE NAME | REFERREE TEAM | REFERREE SIGNATURE

DEFINITIONS: JUDGE

- An organizing committee member
- Responsibilities during each mission
  - starts the official time
  - only official allowed to interact with the operator (s)
  - relays to the referees that a potential victim has been found
  - see JUDGE sheet
- Responsibilities after each mission
  - interprets the map to seek each victim
  - determines the victim location and map quality
  - calculates the score
  - see SCORE sheet
- Has final authority over any disputes

JUDGE

TEAM	RD/MSN	START/END

ROBOT(1) NAME	ROBOT(2) NAME	ROBOT(3) NAME	ROBOT(4) NAME	ROBOT(5) NAME
REFEREE NAME	**REFEREE NAME**	**REFEREE NAME**	**REFEREE NAME**	**REFEREE NAME**

OPERATORS	RESETS
	○ ○ ○ ○ ○

VICTIMS FOUND

V	BOT	ARENA	VICTIM IDS	NOTES
V-1	___	Y - O - R	F - M - H - S - C - TAG	
V-2	___	Y - O - R	F - M - H - S - C - TAG	
V-3	___	Y - O - R	F - M - H - S - C - TAG	
V-4	___	Y - O - R	F - M - H - S - C - TAG	
V-5	___	Y - O - R	F - M - H - S - C - TAG	
V-6	___	Y - O - R	F - M - H - S - C - TAG	
V-7	___	Y - O - R	F - M - H - S - C - TAG	
V-8	___	Y - O - R	F - M - H - S - C - TAG	
V-9	___	Y - O - R	F - M - H - S - C - TAG	
V-10	___	Y - O - R	F - M - H - S - C - TAG	

V	BOT	ARENA	VICTIM IDS	NOTES
V-11	___	Y - O - R	F - M - H - S - C - TAG	
V-12	___	Y - O - R	F - M - H - S - C - TAG	
V-13	___	Y - O - R	F - M - H - S - C - TAG	
V-14	___	Y - O - R	F - M - H - S - C - TAG	
V-15	___	Y - O - R	F - M - H - S - C - TAG	
V-16	___	Y - O - R	F - M - H - S - C - TAG	
V-17	___	Y - O - R	F - M - H - S - C - TAG	
V-18	___	Y - O - R	F - M - H - S - C - TAG	
V-19	___	Y - O - R	F - M - H - S - C - TAG	
V-20	___	Y - O - R	F - M - H - S - C - TAG	

JUDGE NAME	JUDGE TEAM	JUDGE SIGNATURE

RoboCup 2004 Rescue

SCORE

TEAM	RD/MSN	TOTAL

YELLOW ARENA

V-1		V-2		V-3		V-4		V-5		V-6		V-7		V-8		V-9		V-10		POINTS		PENALTIES		ARENA POINTS
	+		+		+		+		+		+		+		+		+		=		-		=	

ARENA POINTS / [1 + OPERATORS]^2 × 0.50 (ARENA WEIGHT) = YELLOW SCORE

+

ORANGE ARENA

V-1		V-2		V-3		V-4		V-5		V-6		V-7		V-8		V-9		V-10		POINTS		PENALTIES		ARENA POINTS
	+		+		+		+		+		+		+		+		+		=		-		=	

ARENA POINTS / [1 + OPERATORS]^2 × 0.75 (ARENA WEIGHT) = ORANGE SCORE

+

RED ARENA

V-1		V-2		V-3		V-4		V-5		V-6		V-7		V-8		V-9		V-10		POINTS		PENALTIES		ARENA POINTS
	+		+		+		+		+		+		+		+		+		=		-		=	

ARENA POINTS / [1 + OPERATORS]^2 × 1.00 (ARENA WEIGHT) = RED SCORE

JUDGE NAME	JUDGE TEAM	JUDGE SIGNATURE

DEFINITIONS: VIDEOGRAPHER

- Either a team member, another team member, or an administrative agent (chosen by the chair) will be equipped with a camcorder and properly labeled tape to capture continuous video of the robot performance.
- Must capture video in an non-interference manner
- All such video will be archived and used to further research and marketing goals
- Each team's robot performance will be distributed to that team after the competition.

DEFINITIONS: AWARDS

Place Awards

- 1st, 2nd, and 3rd place awarded based upon the teams' quantitative performance scores

Minimum Score

- Required for place award
- To be determined by the Co-Chairs after the preliminaries

Qualitative Awards

- For inspired hardware
- For inspired software/sensing

DEFINITIONS: TEAM REPORTS

Team Report

- All teams that receive either a place or qualitative award must provide a document outlining the hardware and software specifications of their robots within 30 days of the last day of competition.
- Any team that has signed a non-disclosure agreement with a third party regarding their robot's hardware or software must inform the Co-Chairs prior to competition

Protests and Rule Changes

- All protests must be filed with the Co-Chairs before the start of the following mission.
- Rule changes may be proposed by any team captain at the end of day meeting. Co-Chairs will consider such changes and make decisions before the next day.

Questions ??